

Letter for Electronic Distribution

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Nevada Division of Environmental Protection
Bureau of Federal Facilities
333 West Nye Land
Carson City, Nevada 8976-0851

September 6, 2000

Runore C. Wycoff, Director
Environmental Restoration Division
U.S. Department of Energy
Nevada Operations Office
P.O. Box 98518
Las Vegas, Nevada 89193-8518

**RE: Data Requirements For Corrective Active Unit (CAU) 97/100 - Yucca
Flat/Climax Mine**

Dear Ms. Wycoff:

The Nevada Division of Environmental Protection (NDEP) is providing the following comments on the specific data requirements for CAU 97/100 and the rationale behind these requirements. NDEP previously provided two letters relating to the review of the preliminary draft of the “Corrective Action Investigation Plan for Corrective Action Units 97 & 100: Yucca Flat and Climax Mine, Nevada Test Site, Draft, Revision 0, March 2000” (YF/CM-DCAIP). The first letter, dated June 9, 2000, discussed the problems that NDEP was having identifying data needs and requirements because of a weak conceptual model. The second letter, dated June 30, 2000, presented general comments on the data needs and requirements for CAU 97/100 - Yucca Flat/Climax Mine.

This letter serves to identify those specific needs which DOE must make a commitment to address, in terms of specific proposals for data collection and study, in a revised CAIP. In addition, the letter outlines general information and data requirements which NDEP expects DOE to address during the data evaluation phase of the Corrective Action

Investigation. This will enable DOE to identify those additional future information needs as a result of gaining a more complete understanding of the system.

Specific Data Needs

NDEP has reviewed the information in the YF/CM-DCAIP and identified four specific issues which must be addressed by the collection of additional data.

- 1) Specific Hydrologic Head Data - The primary controlling factor for the migration of contaminants is the rate and direction of groundwater flow. Insufficient potentiometric head data exist to determine the actual flow directions, presence or absence of vertical flow, and flow rates. In order to address this lack of data, additional wells/piezometers must be installed to determine the actual flow paths. These data then can be used to support DOE's understanding of the flow system prior to development of the CAU-specific flow and transport model.
- 2) Hydrogeologic Setting of Climax Mine - The hydrogeological relationship between the Climax Mine area and the Yucca Flat area has not been adequately characterized. Major structures are known to separate the two areas, yet an incomplete picture exists in terms of the nature of the flow system(s) across the area in question. DOE must address this issue by proposing additional studies to minimize this uncertainty before modeling can be initiated.
- 3) Lower Carbonate Aquifer and the Identified High Pressure Zone - Insufficient information exists concerning the hydraulic connection between the Lower Carbonate Aquifer (LCA) and transmissive units in the upper impacted portion of the geologic section in the Yucca Flat area. Although some hydrologic parameter data exist for the LCA in the Yucca Flat area, coverage is sparse and is not documented as being representative of conditions in the central portion of the valley where recharge to the LCA is thought to occur from overlying aquifers. It is unclear if the areal extent of the LCA in Yucca Flat is well known. A High Pressure Zone, identified within the LCA in earlier work, has not been addressed in the CAIP. Additional data are required to define the extent and any potential affects of this pressure zone on the flow system.
- 4) Contaminant Transport Parameters - Parameters effecting contaminant transport, such as dispersivity, diffusivity, and porosity, require further investigation. DOE's

modeling efforts rely too heavily on previously-published parameter values for similar aquifer types and not on CAU-specific data. Literature values for these parameters, and numbers derived from laboratory batch experiments, may produce acceptable results, however these parameter values must be verified as being representative of actual CAU conditions through in-situ measurements.

Additional Information, and General Data Requirements and Supporting Rationale

- 1) CAIP/Conceptual Model Clarity - In a June 9, 2000 letter, NDEP discussed that the Conceptual model (CMO) in the draft YF/CM DCAIP lacked clarity as to what site specific data were available and utilized in the development of the CMO. It is paramount that the CMO is clear, since the CMO provides the initial overall basis for the development of the data quality objectives.

The CMO needs to clearly identify the following:

- What data were used to develop the CMO?
- What are the data considered to be missing or inadequate or have been postulated from non CAU-specific sources?
- What data are of questionable quality or relevance?

NDEP cannot determine from the present CMO the size and nature of the current state of groundwater contamination resulting from weapons testing. The CMO lacks clarity as to what specific data are available and were utilized in the development of the CMO. This lack of specific detail defining the extent to which the CMO is based on CU-specific data, limits NDEP's ability to identify specific elements of the CMO needing improvement. The CMO must be revised in the final draft of the YF/CM-DCAIP. The extent to which the CMO is based on existing CAU data and not just the understanding of the flow system gained from developing the regional model must be defined. The CMO must present a thorough picture of the hydrogeology, flow conditions, current nature and extent of contamination, and the expected future contaminant fate and transport for the Yucca Flat/Climax Mine Corrective Action Unit.

- 2) Near Field Data - One important data issue for facilitating an understanding of the actual size and extent of contamination are the conditions in the near field. The near field is considered to be the area that is roughly within 10 cavity radii of each event.

The currently available near field data were developed by the Hydrologic Resource Management Program (HRMP), however, these data are limited by scope and the scale under which project evaluations have been conducted. It is questionable if they can appropriately be utilized for an area the size of Yucca Flat considering the number of tests, the varying depth of the events, and site geologic and hydrologic conditions. It is NDEP's position that more near field data are needed. DOE, as part of the CAI data evaluation process, needs to conduct a detailed review of existing near field data and determine what portion of the existing information is applicable and what new data are needed to increase confidence in the understanding of contaminant transport issues in Yucca flat.

- 3) Hydrologic Parameters - The flow model being proposed for Yucca Flat must rely on a complete and reliable set of hydrologic parameter data. While Yucca Flat has the largest data set of all the UGTA CAUs, the existing geologic and hydrologic data are too sparse. The ranges of parameter values in the existing data have not been documented to be representative of the true variability found across the area of investigation. Additional data points for the hydraulic parameters used in the model, or those which simply provide a basis of understanding of the flow system, need to be measured or derived for the principal aquifers within the CAU. These include water level, gradient (vertical and horizontal), hydraulic conductivity, aquifer thickness, and storage coefficient
- 4) Regional Controls on Groundwater Flow and Water Budget - Even though the Yucca Flat/Climax Mine has the most drill holes of any of the CAUs, it is NDEP's position that the major geologic structural controls which influence groundwater movement into, under, through, and out of the Yucca Flat and Climax Mine area are still not adequately understood. This is particularly important for this CAU because of the size of Yucca Flat and the complex array of hydrogeologic features. Controls of interest would include features such as faults, shear zones, and fracture zones, not only in the Yucca Flat/Climax CAI immediate area, but also those in the external Death Valley Groundwater Basin, which influence the groundwater movement into and out of the CAU.

Another aspect of the hydrogeology needing further investigation involves the water budget for the CAU-model area. Studies which attempt to estimate the water entering and leaving the Yucca Flat system through recharge, baseflow, and evapotranspiration

are needed. A water budget is a useful tool for evaluating how well the system is understood. It provides a measure of confidence that model boundary conditions were correctly chosen and that those parameters distributed across wide areas (principally fluxes and recharge) fall within reasonable ranges.

A water budget could be developed for subareas in the CAU. These subareas could be used to tie together hydrologically diverse portions of the CAU into a more acceptable, wider-area model(s) as discussed below. It is necessary that some approximation of the water budget for the areas of investigation be calculated prior to attempting detailed numerical modeling. NDEP views an understanding of regional controls and water budget as fundamental elements of the investigation, and encourages DOE to seek the council of the Technical Working Group (TWG) in formulating these studies.

- 5) Hydrogeochemical Data - Studies of the aqueous geochemistry, which are used to interpret the hydrogeology of the large and complex Yucca Flat/Climax Mine area, are poorly discussed and represented. Additional knowledge is needed in terms of the major ion chemistry, trace elements, and isotopic ratios in the groundwater flow system. Collection and analysis of additional field data of this nature must be done to further characterize the hydrologic system.
- 6) Important Event Characteristics, Source Term, and Release Mechanisms - As investigations of the CAUs have progressed, it has become apparent that what might be termed “important event characteristics” can have a significant effect on radionuclide availability and transport. The CAI must not overlook the potential impact these aspects of weapons testing may have. A discussion is required regarding data available for the following topics:
 - a) shafts, tunnels, and various conduits which may enhance near-field radionuclide movement,
 - b) special or unusual radionuclides or other materials introduced into the near-field environment,
 - c) unusual features of the weapon design or test circumstances that could effect contaminant availability and transport.

The laboratory studies being conducted by Lawrence Livermore National Laboratory and others, involving the availability and solubility of radioactive species in groundwater, are considered an important component of the overall investigation. The inclusion of CAU-specific data in these studies should be considered where possible. The TWG should be encouraged to make recommendations on this point in terms of incorporating applicable field sample data in these studies. NDEP considers the radionuclide fate and transport work being undertaken as part of UGTA to be unique, with respect to similar studies being conducted at other facilities in the DOE complex. That is, these studies should be sensitive to the fact that the suite of radionuclides produced in nuclear detonations is different than those found at sites where special nuclear materials were merely produced and processed. Additionally, the specific geologic materials that the source term interacts with in the UGTA CAUs should be considered in this work.

Preferred Investigation Strategy

Detonations in Yucca Flat/Climax Mine occurred over a wide area and in a complex hydrogeologic setting. NDEP is concerned that hydrogeologic parameters may be significantly different across the many faults and among the various hydrostratigraphic zones present at Yucca Flat/Climax Mine. In an effort to divide the area of investigation into manageable portions and to reduce the overall complexity of the investigative task, NDEP suggests that segmenting Yucca Flat/Climax Mine into several sub-areas may be an effective strategy. Breaking the CAUs into sub-areas based on hydrogeologic criteria would allow a more focused examination of near-field parameters affecting flow and transport.

A smaller-scale sub-area approach taken initially, might be followed by a larger-scale approach should similarities in parameters be found in certain areas. This approach might identify those areas requiring more intensive investigation while allowing other, broader regions to be lumped together and treated similarly.

In order to collect the needed samples and make measurements at depth, it is anticipated that a number of new wells will be required within each sub-area. NDEP expects DOE and the technical work group to devise the purpose, location, samples to be collected, and measurements to be made for each boring. Any drilling proposal submitted should contain at a minimum:

- a) the location of each proposed well,
- b) the anticipated diameter and target depth of each proposed well,
- c) the geologic units that will likely be encountered at each proposed well location,
- d) the anticipated depth to water at each proposed well location,
- e) the purpose of the well and tests to be run, a detailed discussion of each log to be run, the sample collection methodology for each type of sample to be collected, and the method of analysis of each type of sample collected at each proposed well location.

Future Work Scope and Budget Proposals

NDEP expects the YF/CM CAIP will refine the conceptual model and propose an aggressive field investigation program. Tasks which are part of the initial field investigation program must identified and subsequently incorporated into the baseline budget. A firm commitment to perform the specific work and incorporate that work into a baseline budget request is required for the CAIP to be approved. Additionally, future baseline budgets must reflect DOE's resolve to perform the additional work that is anticipated will identified during the data collection and assessment tasks in the data evaluation phase of the CAI.

Questions regarding this matter may be addressed to S. Jaunarajs at (775) 687-4670 Ex. 3030, C. Goewert at (702) 486-2865, or me at (775) 687-4670 Ex. 3039.

Sincerely,

Paul Liebendorfer, P.E.
Chief
Bureau of Federal Facilities

SJ/CJG/js

cc:

Dave Bedsun, DTRA

Ken Hoar, DOE/ES&HD

Patti Hall, DOE/ERD

Frank Di Sanza, DOE/MWD

Robert Bangerter, DOE/ERD

Karen Beckley, NDEP/CC

Mike McKinnon, NDEP/LV

Earle Dixon, CAB Technical Director

Bob Loux, NWPO